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BAAR, David J. P.

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Title: METHOD AND SYSTEM FOR CONTROLLING ACCESS IN DETAIL-IN-CONTEXT PRESENTATIONS

March 18, 2004

The Commissioner of Patents & Trademarks
P.O. Box 1450
Alexandria, Virginia 22313-1450

PRIORITY CLAIM

Dear Sir:

The benefit of the filing date in Canada of a patent application corresponding to the above-identified application, is hereby claimed under Rules 37 CFR 1.55 and 35 U.S.C. 119 in accordance with the Paris Convention for the Protection of Industrial Property. A certified copy of the corresponding Canadian patent application bearing Serial No. 2,411,898, filed November 15, 2002 is submitted herewith.

Respectfully submitted,

March 18/04
Date

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Canadian Patent Office

Certification

This is to certify that the documents attached hereto and identified below are true copies of the documents on file in the Patent Office.

Specification and Drawings, as originally filed, with Application for Patent Serial No: **2,411,898**, on November 15, 2002, by **IDELIX SOFTWARE INC.,** assignee of David A. Baar, for "A Method and System for Controlling Access Detail-in-Context Presentation".

Agent certificateur/Certifying Officer

March 12, 2004

Date

A METHOD AND SYSTEM FOR CONTROLLING ACCESS TO DETAIL-IN-CONTEXT PRESENTATIONS

The invention relates to the field of computer graphics processing, and more specifically to a method and system for controlling access to detail-in-context presentations.

BACKGROUND OF THE INVENTION

Display screens are the primary interface for displaying information from a computer. Display screens are limited in size, thus presenting a challenge to graphical user interface design, particularly when large amounts of information are to be displayed. This problem is normally referred to as the "screen real estate problem".

Well-known solutions to this problem include panning, zooming, scrolling or combinations thereof. While these solutions are suitable for a large number of visual display applications, these solutions become less effective where sections of the visual information are spatially related, such as maps, three-dimensional representations, newspapers and such like. In this type of information display, panning, zooming and/or scrolling is not as effective as much of the context of the panned, zoomed or scrolled display is hidden.

A recent solution to this problem is the application of "detail-in-context" presentation techniques. Detail-in-context is the magnification of a particular region of interest (the "focal region" or "detail") in a data presentation while preserving visibility of the surrounding information (the "context"). This technique has applicability to the display of large surface area media, such as maps, on limited size computer screens including laptop computers, personal digital assistants ("PDAs"), and cell phones.

In the detail-in-context discourse, differentiation is often made between the terms "representation" and "presentation". A representation is a formal system, or mapping, for specifying raw information or data that is stored in a computer or data processing system. For example, a digital map of a city is a representation of raw data including street names and the relative geographic location of streets and utilities. Such a representation may be displayed visually on a computer screen or printed on paper. On the other hand, a presentation is a spatial organization of a given representation that is appropriate for the task at hand. Thus, a

presentation of a representation organizes such things as the point of view and the relative emphasis of different parts or regions of the representation. For example, a digital map of a city may be presented with a region magnified to reveal street names.

In general, a detail-in-context presentation may be considered as a distorted view (or distortion) of a portion of the original representation where the distortion is the result of the application of a "lens" like distortion function to the original representation. A detailed review of various detail-in-context presentation techniques such as Elastic Presentation Space may be found in a publication by Marianne S. T. Carpendale, entitled "A Framework for Elastic Presentation Space" (Carpendale, Marianne S. T., *A Framework for Elastic Presentation Space* (Burnaby, British Columbia: Simon Fraser University, 1999)), and incorporated herein by reference.

In general, detail-in-context data presentations are characterized by magnification of areas of an image where detail is desired, in combination with compression of a restricted range of areas of the remaining information (i.e. the context), the result typically giving the appearance of a lens having been applied to the display surface. Using the techniques described by Carpendale, points in a representation are displaced in three dimensions and a perspective projection is used to display the points on a two-dimensional presentation display.

One shortcoming of these detail-in-context presentation systems is that they do not allow for the effective control of access by users to information in detail-in-context presentations or in portions thereof.

A need therefore exists for the effective control of user access to detail-in-context presentations in detail-in-context presentation systems. Consequently, it is an object of the present invention to obviate or mitigate at least some of the above mentioned disadvantages.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention may best be understood by referring to the following description and accompanying drawings. In the description and drawings, line numerals refer to like structures or processes. In the drawings:

FIG. 1 is a graphical representation of the geometry for constructing a three-dimensional (3D) perspective viewing frustum, relative to an x, y, z coordinate system, in accordance with known elastic presentation space graphics technology;

FIG. 2 is a graphical representation of the geometry of a presentation in accordance with known elastic presentation space graphics technology;

FIG. 3 is a block diagram illustrating an exemplary data processing system for implementing an embodiment of the invention; and,

FIG. 4 is a schematic diagram illustrating user access control for detail-in-context presentations in accordance with an embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In the following description, numerous specific details are set forth to provide a thorough understanding of the invention. However, it is understood that the invention may be practiced without these specific details. In other instances, well-known software, circuits, structures and techniques have not been described or shown in detail in order not to obscure the invention. In the drawings, like numerals refer to like structures or processes.

The term "data processing system" is used herein to refer to any machine for processing data, including the computer systems and network arrangements described herein. The term "Elastic Presentation Space" ("EPS") (or "Pliable Display Technology" ("PDT")) is used herein to refer to techniques that allow for the adjustment of a visual presentation without interfering with the information content of the representation. The adjective "elastic" is included in the term as it implies the capability of stretching and deformation and subsequent return to an original shape. EPS graphics technology is described by Carpendale in "A Framework for Elastic Presentation Space" (Carpendale, Marianne S. T., *A Framework for Elastic Presentation Space* (Burnaby, British Columbia: Simon Fraser University, 1999)), which is incorporated herein by reference. In EPS graphics technology, a two-dimensional visual representation is placed onto a surface; this surface is placed in three-dimensional space; the surface, containing the representation, is viewed through perspective projection; and the surface is manipulated to effect the reorganization of

image details. The presentation transformation is separated into two steps: surface manipulation or distortion and perspective projection.

FIG. 1 is a graphical representation **100** of the geometry for constructing a three-dimensional ("3D") perspective viewing frustum **220**, relative to an x, y, z coordinate system, in accordance with known elastic presentation space (EPS) graphics technology. In EPS technology, detail-in-context views of two-dimensional ("2D") visual representations are created with sight-line aligned distortions of a 2D information presentation surface within a 3D perspective viewing frustum **220**. In EPS, magnification of regions of interest and the accompanying compression of the contextual region to accommodate this change in scale are produced by the movement of regions of the surface towards the viewpoint ("VP") **240** located at the apex of the pyramidal shape **220** containing the frustum. The process of projecting these transformed layouts via a perspective projection results in a new 2D layout which includes the zoomed and compressed regions. The use of the third dimension and perspective distortion to provide magnification in EPS provides a meaningful metaphor for the process of distorting the information presentation surface. The 3D manipulation of the information presentation surface in such a system is an intermediate step in the process of creating a new 2D layout of the information.

FIG. 2 is a graphical representation **200** of the geometry of a presentation in accordance with known EPS graphics technology. EPS graphics technology employs viewer-aligned perspective projections to produce detail-in-context presentations in a reference view plane **201** which may be viewed on a display. Undistorted 2D data points are located in a basal plane **210** of a 3D perspective viewing volume or frustum **220** which is defined by extreme rays **221** and **222** and the basal plane **210**. The VP **240** is generally located above the centre point of the basal plane **210** and reference view plane ("RVP") **201**. Points in the basal plane **210** are displaced upward onto a distorted surface **230** which is defined by a general 3D distortion function (i.e. a detail-in-context distortion basis function). The direction of the viewer-aligned perspective projection corresponding to the distorted surface **230** is indicated by the line FPo - FP **231** drawn from a point FPo **232** in the basal plane **210** through the point FP **233** which corresponds to the focus or focal region or focal point of the distorted surface **230**.

EPS is applicable to multidimensional data and is well suited to implementation on a computer for dynamic detail-in-context display on an electronic display surface such as a monitor. In the case of two dimensional data, EPS is typically characterized by magnification of areas of an image where detail is desired **233**, in combination with compression of a restricted range of areas of the remaining information (i.e. the context) **234**, the end result typically giving the appearance of a lens **230** having been applied to the display surface. The areas of the lens **230** where compression occurs may be referred to as the "shoulder" **234** of the lens **230**. The area of the representation transformed by the lens may be referred to as the "lensed area". The lensed area thus includes the focal region and the shoulder. To reiterate, the source image or representation to be viewed is located in the basal plane **210**. Magnification **233** and compression **234** are achieved through elevating elements of the source image relative to the basal plane **210**, and then projecting the resultant distorted surface onto the reference view plane **201**. EPS performs detail-in-context presentation of n-dimensional data through the use of a procedure wherein the data is mapped into a region in an (n+1) dimensional space, manipulated through perspective projections in the (n+1) dimensional space, and then finally transformed back into n-dimensional space for presentation. EPS has numerous advantages over conventional zoom, pan, and scroll technologies, including the capability of preserving the visibility of information outside **234** the local region of interest **233**.

For example, and referring to FIGS. 1 and 2, in two dimensions, EPS can be implemented through the projection of an image onto a reference plane **201** in the following manner. The source image or representation is located on a basal plane **210**, and those regions of interest **233** of the image for which magnification is desired are elevated so as to move them closer to a reference plane situated between the reference viewpoint **240** and the reference view plane **201**. Magnification of the focal region **233** closest to the RVP **201** varies inversely with distance from the RVP **201**. As shown in FIGS. 1 and 2, compression of regions **234** outside the focal region **233** is a function of both distance from the RVP **201**, and the gradient of the function describing the vertical distance from the RVP **201** with respect to horizontal distance from the focal region **233**. The resultant combination of magnification **233** and compression **234** of the image as seen from the reference viewpoint **240** results in a lens-like effect similar to that of a magnifying glass applied to the image. Hence, the various functions used to vary the magnification and compression of the source image via vertical displacement from the basal plane **210** are

described as lenses, lens types, or lens functions. Lens functions that describe basic lens types with point and circular focal regions, as well as certain more complex lenses and advanced capabilities such as folding, have previously been described by Carpendale.

System. FIG. 3 is a block diagram of an exemplary data processing system **300** for implementing an embodiment of the invention. The data processing system is suitable for implementing EPS technology and for viewing presentations in conjunction with a graphical user interface ("GUI"). The data processing system **300** includes an input device **310**, a central processing unit or CPU **320**, memory **330**, and a display **340**. The input device **310** may include a keyboard, mouse, trackball, or similar device. The CPU **320** may include dedicated coprocessors and memory devices. The memory **330** may include RAM, ROM, databases, or disk devices. And, the display **340** may include a computer screen or terminal device. The data processing system **300** has stored therein data representing sequences of instructions which when executed cause the method described herein to be performed. Of course, the data processing system **300** may contain additional software and hardware a description of which is not necessary for understanding the invention.

User Access Control for Detail-In-Context Presentations. FIG. 4 is a schematic diagram **400** illustrating user access control for detail-in-context presentations in accordance with an embodiment of the invention.

Multi-scale and detail-in-context presentations of data using techniques such as pliable surfaces are useful in presenting large amounts of information on limited-size display surfaces. Multi-scale views, such as inset views, incorporate views of data sets at more than one level of magnification. Detail-in-context views are a subset of multi-scale views, and allow magnification of a particular region of interest (the "focal region") in a data presentation while preserving continuous visibility of most or all of the surrounding information. In the following, the use of detail-in-context technologies including Pliable Display Technology ("PDT") for the control of access to confidential or otherwise protected data in forms such as imagery or text documents, is described. For reference, see United States Patent Application Serial No. 10/137,648, which is incorporated herein by reference.

As mentioned above, detail-in-context data presentations are characterized by magnification of areas of an image where detail is desired, in combination with compression of a restricted range of areas of the remaining information (the "context"), the end result typically giving the appearance of a lens having been applied to the display surface. This "lens" can be described as having a focal region having high magnification and a surrounding "shoulder" region which can visibly connect the focal region and the context. The presence of the lens also provides navigational cues to the user as to the location of a magnified region of interest within a region of the context.

In some detail-in-context cases, such as PDT, it is possible to control the information visible in the lens independently from the information visible outside the lens. In this case, and according to one embodiment of the invention, in the event that it is desired to restrict access to content that could be displayed in the lens, such as high resolution imagery of politically sensitive areas or confidential details in a document, a means of access control can be used to prevent unauthorized viewing of information in the lens. This means is shown schematically in FIG. 4.

In one embodiment of the invention, if it is desired to prevent a user from viewing regions of the source data at a magnified level, the lens may be prevented from being positioned in particular regions of the data, or the lens may be otherwise prevented from displaying data in these regions. This embodiment of the invention may be used, for example, in an Internet commerce application in a case where it is desired to let the user inspect part of an image in detail, but prevent the user from downloading the entirety of the image without purchasing the rights to do so.

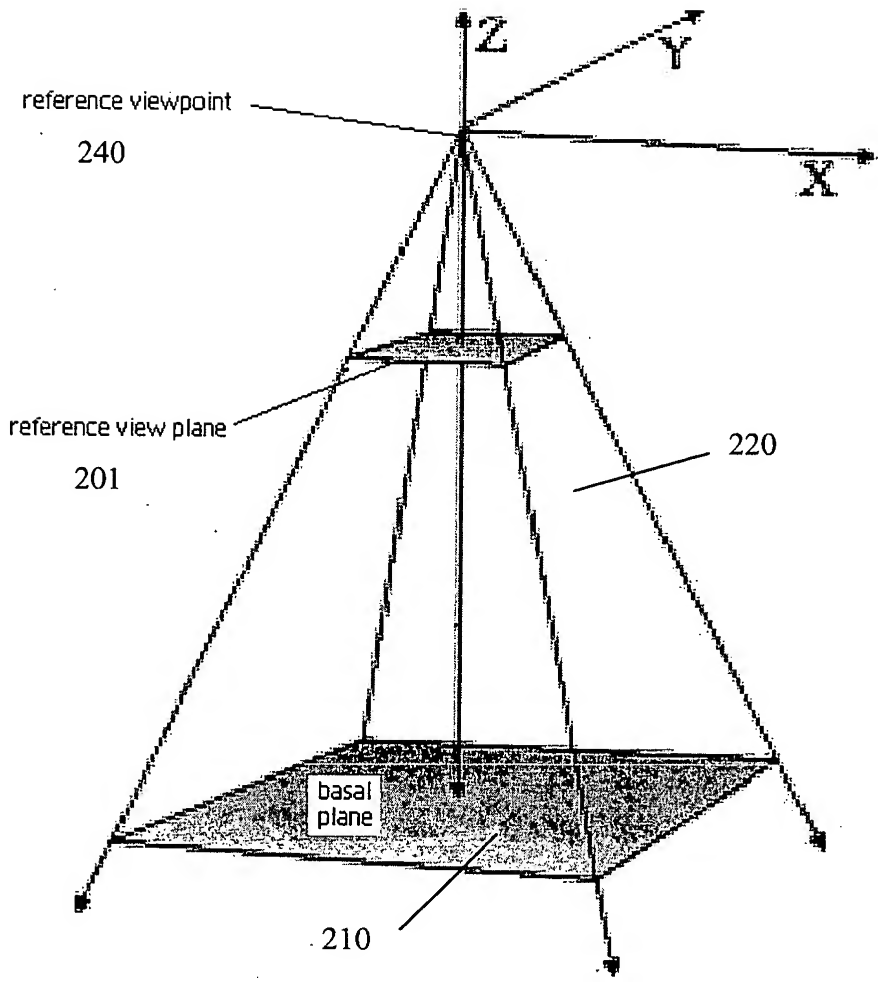
In one embodiment of the invention, in the case that the original data is encrypted, the method of providing access control may be via decryption or by giving the user the means to decrypt the data for display in the lens.

Data Carrier Product. The sequences of instructions which when executed cause the method described herein to be performed by the exemplary data processing system of FIG. 3 can be contained in a data carrier product according to one embodiment of the invention. This data carrier product can be loaded into and run by the exemplary data processing system of FIG. 3.

Computer Software Product. The sequences of instructions which when executed cause the method described herein to be performed by the exemplary data processing system of FIG. 3 can be contained in a computer software product according to one embodiment of the invention. This computer software product can be loaded into and run by the exemplary data processing system of FIG. 3.

Integrated Circuit Product. The sequences of instructions which when executed cause the method described herein to be performed by the exemplary data processing system of FIG. 3 can be contained in an integrated circuit product including a coprocessor or memory according to one embodiment of the invention. This integrated circuit product can be installed in the exemplary data processing system of FIG. 3.

100



Z
Y
X
reference viewpoint
240
reference view plane
201
220
basal
plane
210

FIG. 1

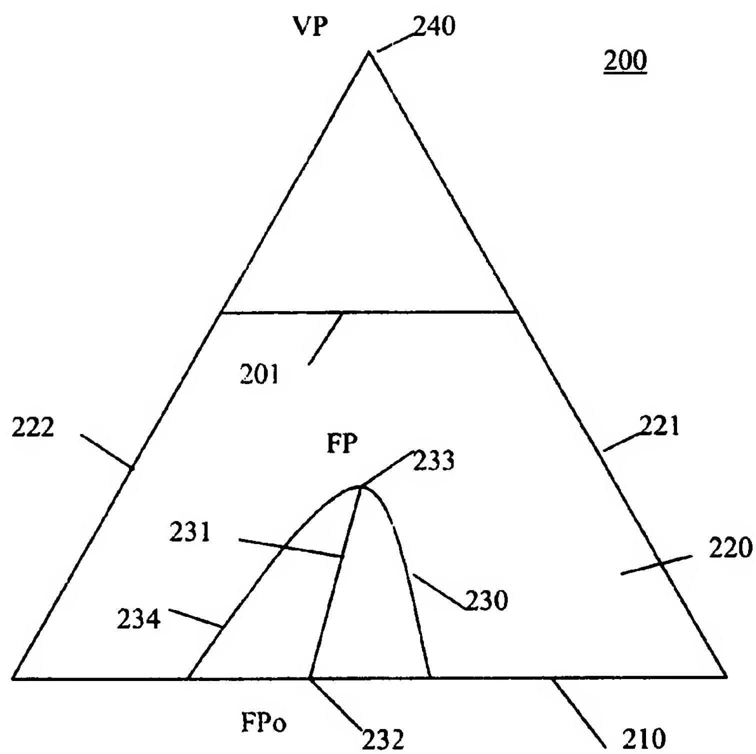


FIG. 2

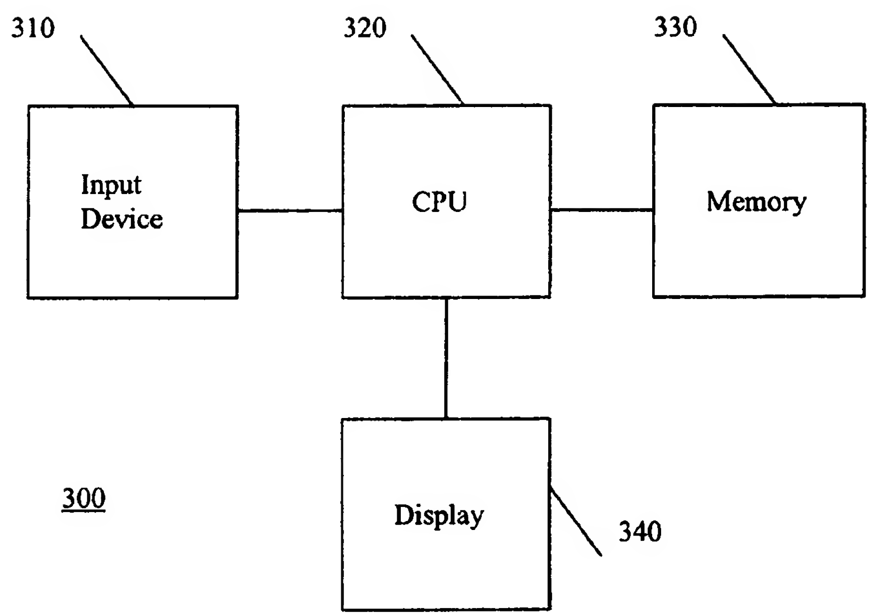


FIG. 3

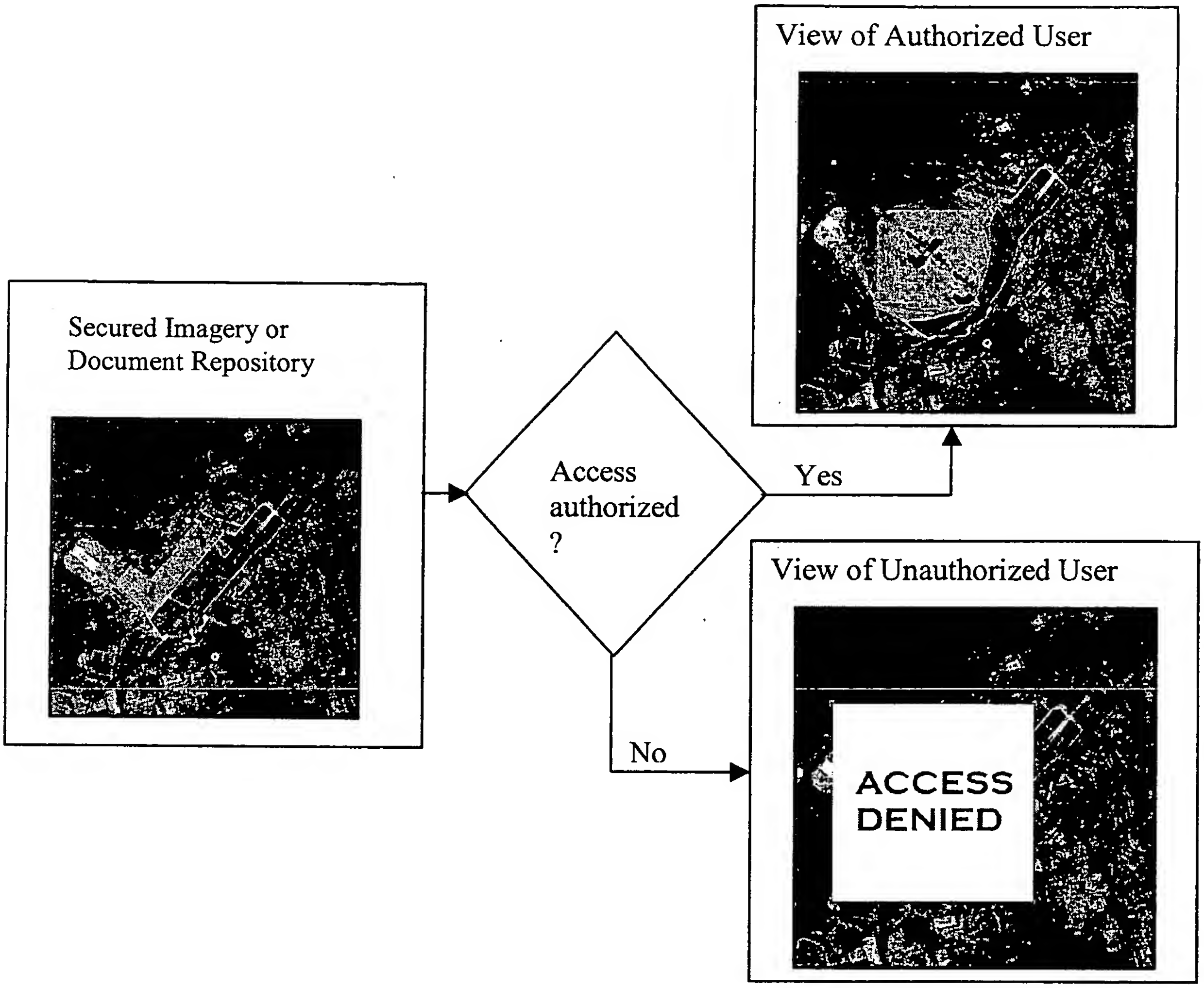

Secured Imagery or
Document Repository
Access
authorized
?
Yes
No
View of Authorized User
View of Unauthorized User
ACCESS
DENIED

FIG. 4